A NEW SPECIES OF CYAMID (CRUSTACEA: AMPHIPODA) FROM A STRANDED CETACEAN IN SOUTHERN BAHIA, BRAZIL

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ABSTRACT

The family Cyamidae comprises 28 species of parasitic crustaceans, all of which live exclusively on the skin of cetaceans. On 17 October 2000, a dead male of the short-finned pilot whale, *Globicephala macrorhynchus* Gray, 1846, was found stranded in coastal waters of the municipality of Ilhéus, Bahia, Brazil. Two cyamid species were found attached to the pilot whale's epidermis. These whale-lice were collected and identified as *Isocyamus delphinii* Guérin-Méneville, 1836, and a new species of *Syncyamus*. This is the first record of these cyamid genera from the South American coast, and *Syncyamus* is recorded for the first time from a pilot whale. This record represents the third report of coexistence between *Isocyamus* and *Syncyamus*. This new species is erected on the basis of its external morphology and named *Syncyamus ilheusensis*. A list of new and previously published records of the genus *Syncyamus* is also presented.

The family Cyamidae includes a total of seven genera and 28 species (Martin and Heyning, 1999), all of which are ectoparasites that live in association with whales, dolphins, and porpoises. Cyamid biology is poorly known because much of the material available for study was collected during the heyday of commercial whaling, and new collections are generally restricted to strandings of their hosts in coastal waters.

The family Cyamidae was absent from two recent reviews of the Brazilian amphipod fauna (Wakabara et al., 1991; Wakabara and Serejo, 1998), one of them published in the Catalogue of Crustacea of Brazil (Wakabara and Serejo, 1998). Records of these caprellidan amphipods in the coastal waters of South America are scarce and include cyamids only from sperm and right whales. Sawaya (1938) provided the only previous record of cyamids from the Brazilian coast. He identified two species (*Cyamus ovalis* Roussel de Vauzème, 1834, and *Cyamus erraticus* Roussel de Vauzème, 1834) from a specimen of the southern right whale, *Eubalaena australis* (Desmoulins, 1822), found stranded near Santos, in the state of São Paulo. Margolis (1955) noted *Cyamus gracilis* Roussel de Vauzème, 1834, also from a southern right whale off Patagonia. Buzeta (1963) reported *Cyamus catodontis* Margolis, 1954 (as *C. bahamondei* Buzeta, 1963)[1], and *Neocyamus physeteris* (Pouchet, 1888) from the sperm whale, *Physeter catodon* Linnaeus, 1758. He collected both species from sperm whales examined at whaling stations on the Chilean coast, and, of the 388 whales examined, 74 individuals were parasitized by cyamids (see Buzeta, 1963: 127). Lincoln and Hurley (1974) also noted specimens of *N. physeteris* collected from four sperm whales at Paita, Peru.

Herein, we describe cyamids collected from a host identified as a short-finned pilot whale, *Globicephala macrorhynchus* Gray, 1846. The short-finned pilot whale is a cosmopolitan species, occurring in tropical and subtropical waters (Reeves et al., 2002). Although generally thought to be a deep-water species, *G. macrorhynchus* often appears near the shore. Records of *G. macrorhynchus* are sparse, especially in southern Atlantic

[1] Buzeta (1963) described a new species from his collections, which he named *Cyamus bahamondei*. Examination of paratype material for both *C. bahamondei* and *C. catodontis* Margolis, 1954, revealed that *Cyamus bahamondei* Buzeta, 1963, is the junior synonym of *Cyamus catodontis* Margolis, 1954 (see Haney, 1999).

waters (Martin, 1990; Hetzel and Lodi, 1993). In Brazil, records of *G. macrorhynchus* exist for the coasts of the States of Piauí, Ceará, Rio Grande do Norte, Paraíba, Pernambuco, Bahia, and São Paulo (Hetzel and Lodi, 1993).

The whale from which the cyamids were collected bore six wounds, probably from attacks by the cookie cutter shark *Isistius brasiliensis* (Quoy and Gaimard, 1824). These wounds were free of parasites. The host, a 2.5-m long adult male, was found stranded dead on 17 October 2000 in the littoral zone at Ponta do Ramo, municipality of Ilhéus (14º 46′ 24″S, 39º 03′ 12″W), State of Bahia, northeastern Brazil. Individuals of the genus *Isocyamus* were localized around the anus and blowhole of the host; *Syncamus* was collected from the whale's ocular mucosae.

Material and Methods

Forty-eight whale-lice were collected by hand from the stranded host and fixed in a solution of 70% ethyl alcohol, glycerin, and salicilate of methyla. Specimens were examined using Wild M-5 and Olympus stereomicroscopes equipped with drawing tubes. Mouthparts were dissected, mounted in glycerol, and examined using a Nikon Labophot-2 compound microscope. Three specimens were prepared for scanning electron microscopy (SEM) with the following sequence: dehydration to 100% ethanol, air-drying in hexamethyldisilazane (HMDS), mounting on stubs and sputter-coating with gold. The specimens were examined with a Cambridge Stereoscan 360 microscope at 10kV.

Thirteen specimens identified as *Isocyamus delphinii* Guérin-Méneville, 1836 (four males, 1.6–4.4 mm; nine females, 3.7–5.3 mm) were catalogued and deposited in the zoological collection of Project MAMA, Universidade Estadual de Santa Cruz, Ilhéus, Brazil (ZUESC/MAMA 0003). The collection at the Natural History Museum of Los Angeles County (LACM) houses three specimens of *I. delphinii* (LACM CR 2000-016.1), one of which is maintained on a specimen mount for SEM. Material of the new species is listed below.

Syncyamus ilheusensis new species

Figures 1–5

Type Locality and Host.—South America, northeastern Brazil, State of Bahia, municipality of Ilhéus, Ponta do Ramo, 14º 46′ 24″S, 39º 03′ 12″W, littoral zone, from 2.5-m long male short-finned pilot whale *Globicephala macrorhynchus* Gray, 1846; collector M. S. S. Reis, 17 October 2000.

Known Hosts and Distribution.—Known only from *Globicephala macrorhynchus*, recorded from tropical and warm temperate waters of the Pacific, Indian, and Atlantic oceans, most commonly at latitudes lower than 35º (see González et al., 2000).

Material Examined.—Holotype male, 4.7 mm (ZUESC/MAMA 0001); allotype female, 4.4 mm (LACM CR2001-016.3); 18 paratype males, 1.9–4.6 mm, and eight paratype females, 3.8–4.6 mm (ZUESC/MAMA 0002); three paratype males, 2.6–4.1 mm, and one paratype female 4.6 mm (LACM CR2001-016.2; of these, one male and female stored on SEM specimen mount).

Diagnosis.—Pereonite two bearing paired lobes along anterior margin, with medialmost lobe much larger in size; lateral gills uniramous and medially directed, not reaching anterior margin of pereonite two; pereonites three and four of male each bearing single pair of medial gills, subtriangular, tapering distally and quite small, approximately one-third length of lateral gill; pereonites three and four lacking acute ventral

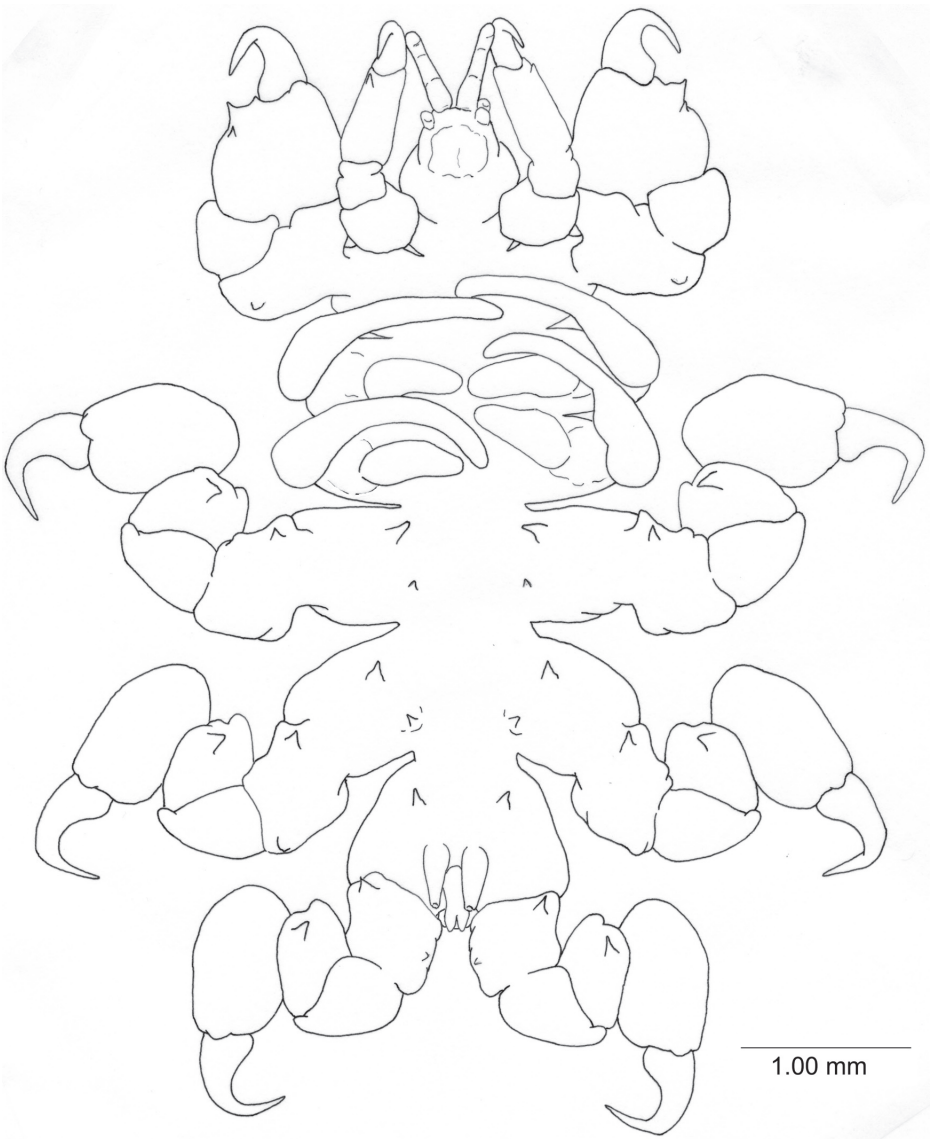

Figure 1. *Syncyamus ilheusensis*, new species: male holotype specimen (ZUESC/MAMA 0001), ventral view.

processes; pereonites five, six, and seven of male bearing two pairs, two pairs and one pair of acute ventral processes, respectively.

Description of Holotype Male, 4.7 mm.—Body (Figs. 1–3).—Thin, showing extreme dorso-ventral depression; eyes small and round; head ovate, completely fused with pereonite one; lateral incision between head and pereonite one absent [present in *Platycyamus*]; antero-medial margin of pereonite two deeply recessed; antero-lateral margin of pereonite two with infolding producing two lobes, medial lobe being much larger than lateral lobe (Fig. 5B); posterolateral margin of pereonite two evenly rounded, lacking processes; pereonites three and four shorter than other somites, with evenly rounded anterolateral margin; well rounded laterally, bulbous with even posterolateral margin;

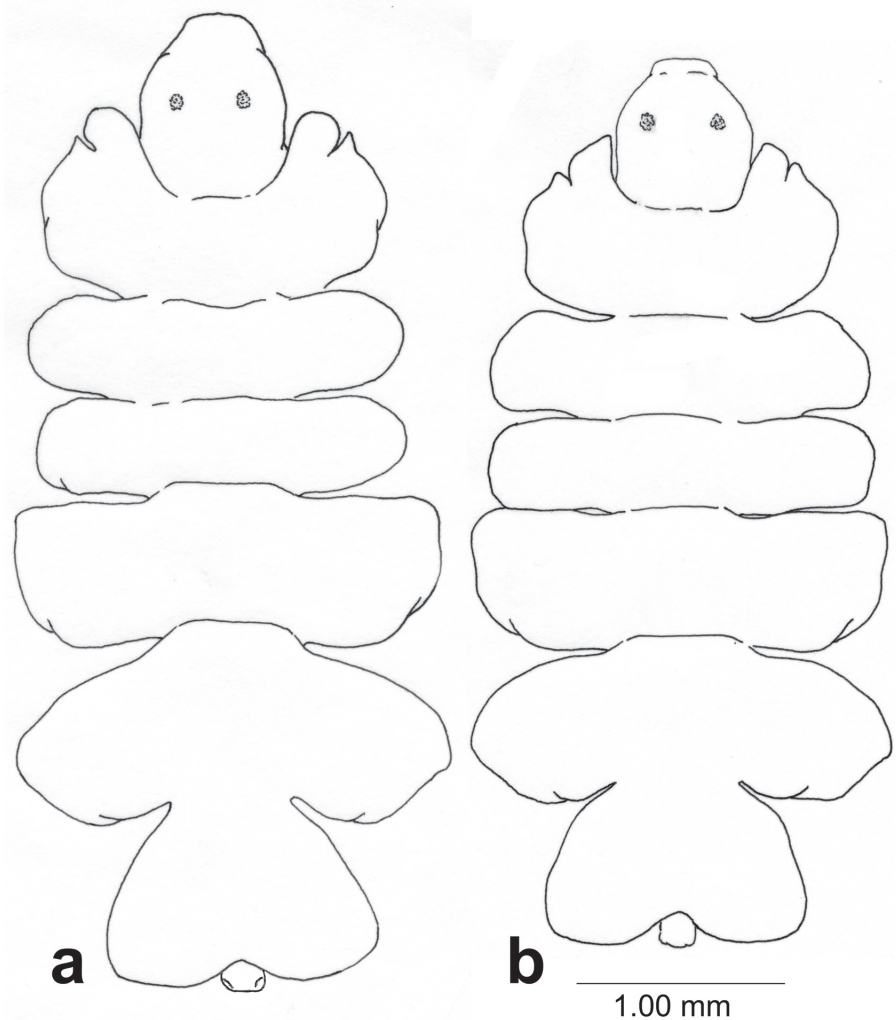

Figure 2. *Syncyamus ilheusensis*, new species: dorsal aspect of pereon and abdomen, appendages not drawn. A) male holotype (ZUESC/MAMA 0001); B) female allotype (LACM CR2001-016.3). 1.0-mm scale bar applies to both figures.

ventral surface of pereonites three and four lacking spines; pereonites three and four more narrow than pereonites five and six; pereonites five and six with slight cuticular expansion on postero-lateral margin; pereonite six broadest somite; pereonite five with two pairs of acute ventral spines; pereonite six with two pairs of acute ventral spines; pereonite seven bearing one pair of acute ventral spines; anterior pair of ventral spines on pereonites five and six much larger than posterior pair, also bearing minute setae but absent on posterior pair; all pereonites fused along ventro-medial surface; postero-lateral margin of pereonite seven evenly rounded, lacking flange; posterior margin of peronite seven with rounded, "U"-shaped invagination; penes (Fig. 1) large, posteriorly directed and parallel to each other, each with semicircular apical pore; abdomen consisting of single somite.

Antennule (Fig. 5A) *and Antenna* (Fig. 5B).—Antennule four-articulate, though all articles nearly fused; terminal article minute, bearing apical tuft of setae; antenna three-

Figure 3. *Syncyamus ilheusensis*, new species: female allotype specimen (LACM CR2001-016.3), right side of ventral surface.

articulate, partly fused, article two with sparsely setose subterminal setal crown, article three vestigial, with apical tuft of simple setae.

Mouthparts (Fig. 4).—Labrum with disto-medial invagination, producing distally rounded left and right lobes; each mandible with molar process reduced and unornamented, submolar seta [present in *Cyamus*] lacking; right mandible with six-toothed incisor and multituberculate lacinia mobilis; left mandible with approximately six-toothed incisor, teeth not well defined, and five-toothed lacinia mobilis, teeth more distinct than those of incisor; left mandible bearing several circumplumose setae at base of lacinia mobilis; labium outer lobes heavily setose distally, longer than inner lobes; inner lobes of labium fully fused, producing rounded and setose apex; maxillule, outer lobe with seven denticulate setae; maxillulary palp one-articulate, apex bearing 5–6 setae; ma-

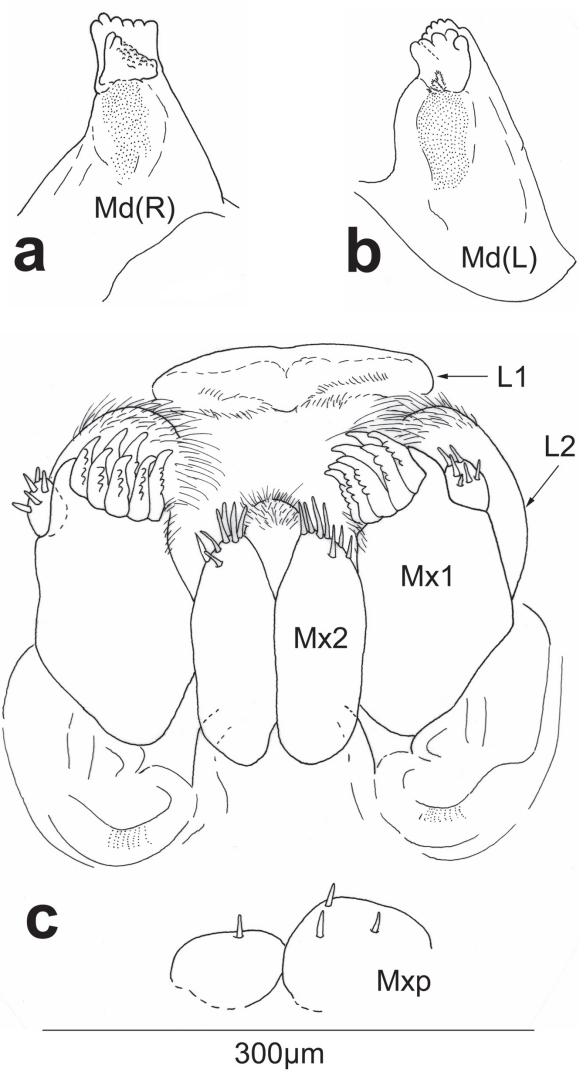

Figure 4. *Syncyamus ilheusensis*, new species: paratype male (LACM CR2001-016.2). A) right mandible Md(R); B) left mandible, Md(L); c, buccal field, in situ, showing L1, labrum; L2, labium; Mx1, maxillules; Mx2, maxillae; Mxp, maxillipeds, single-segmented. 300-µm scale bar applies to all figures.

xilla with outer and inner lobes fused, lateral and medial margins of each parallel, apex bearing simple setae; maxillipeds greatly reduced, consisting of two short, subtriangular lobes, each bearing several simple setae; maxillipedal palp absent.

Pereopod One (Figs. 1,3,5C).—Four-articulate, approximately one-third size of pereopod two; coxa fused with pereon; propodus, inferior (palmar) margin with single subterminal spine.

Pereopod Two (Figs. 1,3,5D).—Coxa fused with pereon; anterior margin of basis slightly expanded, producing flange; ventral face of basi-ischium with blunt process on postero-lateral corner, also with slight indentation marking site of fusion; superior face of propodus with many minute triangular processes distally; palmar margin of propodus

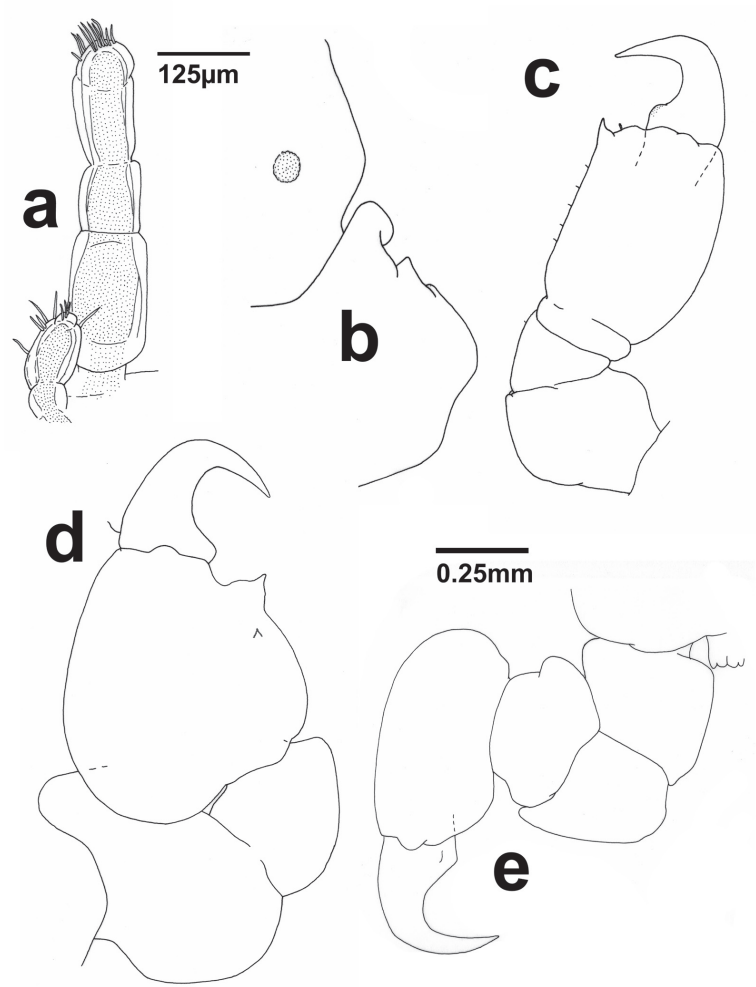

Figure 5. *Syncyamus ilheusensis*, new species: paratype male (LACM CR2001-016.2). A) antennule and antenna, right, ventral; B) antero-lateral margin of pereonite two, showing infolding, part of head also visible, right, dorsal; C) pereopod one (gnathopod one), right, ventral face; D) pereopod two, left, ventral face; E) pereopod seven, left, dorsal face. 125-µm scale bar refers only to antennule and antenna; remaining drawings associated with 0.25-mm scale bar.

with acute medial spine and larger, acute subterminal spine; inferior margin smooth; cuticular scales of inferior margin of propodus absent; dactylus with field of minute subtriangular processes covering proximal one-third of article, otherwise unornamented.

Pereopods Three and Four.—Absent, with exception of the coxa fused to pereon; pereonites three and four bearing stout, uniramous and medially directed lateral gill; lateral gill cylindrical, broadest at base and tapering slightly to rounded apex; distalmost ends of left and right lateral gills overlapping; pereonites three and four bearing cone-shaped medial (accessory) gill; medial gill much shorter than lateral gill, also arising as coxal epipod (see Figs. 1,3).

Pereopods Five Through Seven (Figs. 1,3,5E).—Coxae fused with pereon; basi-ischium with large, acute spine, located proximally on antero-ventral face; posterior margin of basis with curved depression at site of fusion between basis and ischium, giving

posterior margin lobed appearance; second subacute spine on postero-ventral face of basi-ischium of pereopods six and seven; anterior margin of ischium even, unornamented; inferior margin of merus even, lacking setal row; ventral face of carpus with large, acute spine; propodus robust, subelliptical; superior surface of propodus with minute triangular processes distally; proximal one-third of superior surface covered by minute subtriangular processes; angle of recurve of dactylus extreme, approximately 90º.

Pleopods (Figs. 1,3).—Present as single pair, fused basally and separate distally, with each pleopod tapering toward apex and bearing short seta along its lateral margins; pleopods subequal in length to penes; one pair of uropods present, each consisting of minute, rounded lobe.

Description of Allotype Female, 4.4 mm (Figs. 2B,3).—Pereonites three and four more broad than those of male, subequal in width to pereonites five and six; pereonites three and four lacking posterior medial gill, instead bearing subtriangular oöstegite; margins of oöstegites lined with short, simple setae; pereonites five, six, and seven with zero, two, and one pair(s) of ventral spines, respectively; pereonite five bearing genital valves; medial margin of genital valve well rounded, bearing cluster of short setae; left and right valves abutting along postero-medial margin; pereonite seven lacking penes.

Etymology.—The specific name "*ilheusensis*" is given for the city in Brazil, near which the cetacean host was found stranded.

Remarks.—The number of articles of the antennules and antennae of most whalelice is difficult to assess. In species of the genus *Cyamus*, individuals bear four well demarcated articles for each of these appendages. However, in most odontocete-associated cyamid species, the articles of the antennules and antennae are variably fused. The site(s) of fusion between two or more articles might still be apparent, revealed by a marked circular indentation of the article, yet the cuticle is continuous, and a functional joint is lacking. For instance, Sedlak-Weinstein (1991) reported a four-articulate antennule for *S. aequus*, but her electron micrograph showed only an indentation where the terminal article is fused to the penultimate article. There is also evidence of the fusion of articles of the limbs. The first free article of each pereopod, for instance, is presumed to be formed by fusion of the basis and ischium. Even this article is partly fused to the body (see Fig. 1). Cyamids, with the exception of only two species, possess one or more pairs of acute cuticular projections on the ventral surface of the pereonites. We refer to these as spines, as they are not articulated. These paired ventral spines have been used widely to identify species (e.g., Leung, 1967), and, indeed, there appears to be no intraspecific variation in the number and location of these features on adult specimens. The medial, or accessory, gills are not present in all individuals of the genus *Syncyamus*. Lincoln and Hurley (1981) pointed to the absence of medial gills in their male specimens of *Syncyamus aequus* (Lincoln and Hurley, 1981) as a characteristic that distinguished *S. aequus* from *Syncyamus pseudorcae* (Bowman, 1955). However, male individuals from the type series of *S. aequus* are quite small (<2 mm), and gills are among those features that vary considerably in appearance with the size of the individual. A detailed study of ontogenetic variation in gill morphology therefore is in order, and, at this point, we do not recommend that species of *Syncyamus* be identified solely on the basis of the presence or absence of this feature.

Discussion

Bowman (1955) erected the genus *Syncyamus* for 26 specimens collected from a false killer whale, *Pseudorca crassidens* (Owen, 1846), captured in the Gulf of Mexico. Those specimens, described by Bowman as *S. pseudorcae*, differed from all other known cyamids in several respects. *Syncyamus pseudorcae* was quite small relative to the size of other cyamids, with the average size of adults at <5 mm. The extreme reduction of the mouthparts and the recessed anterior margin of the second thoracic segment were also noted (Bowman, 1955).

Bowman (1958) examined specimens of *Syncyamus* from a dolphin tentatively identified as a long-snouted dolphin, *Stenella attenuata* (Gray, 1846), originally referred to by Bowman as *Stenella graffmani* (Lönnberg, 1934). Several differences were noted between these specimens from the Pacific coast of Panama and *S. pseudorcae*, particularly their smaller size and the asymmetry of the lobes on the antero-lateral margin of the second thoracic somite. However, Bowman (1958) refrained from erecting a new species for the specimens from *Stenella*.

Bowman (1958), however, did discover that the first member of *Syncyamus* to be described was actually *Cyamus chelipes* Costa, 1866. The description by the Italian entomologist was based upon a single female specimen collected from "un Delfino comun" caught in the Gulf of Naples. Upon examining Costa's drawings and description, Bowman stated, "it is obvious...that his species belongs in the genus *Syncyamus*. It is impossible to tell from Costa's account whether *C. chelipes* is conspecific with the Gulf of Mexico and Panama Bay specimens." Costa (1866) made no mention of depositing the specimen in any collection. However, if retained, it seems likely that the specimen would have been placed in the collections of the Museo di Zoologia, which houses many of Costa's collections. Unfortunately, despite contacting the Museo di Zoologia, we have been unable to determine whether or not the holotype remains available for study.

More than two decades passed before a second species of *Syncyamus* was described; Lincoln and Hurley (1981) introduced *Syncyamus aequus* for 27 specimens collected from the dolphins *Delphinus delphis* Linnaeus, 1758, and *Stenella coeruleoalba* (Meyen, 1833), off the coast of South Africa. *Syncyamus aequus* differs from *S. pseudorcae* in the morphology of pereopods one and two, the asymmetry of the lobes on the anterior margin of the second thoracic segment, and body size. It is quite possible that those specimens noted by Bowman (1958) from *S. attenuata* are *S. aequus*, a possibility recognized by Lincoln and Hurley (1981). *Syncyamus aequus* was redescribed by Mariniello et al. (1994), who paid particular attention to the spination of the first two pairs of pereopods. Mariniello et al. (1994) examined nine new specimens from *S. coeruleoalba* in Italian waters and the single paratype of *S. aequus* housed at the British Museum (registration number PEM K2g). Unfortunately, the remainder of the type series for *S. aequus*, from the Port Elizabeth Museum, recently has been lost (G. Watson, Bayworld, pers. comm.). Collectively, *Syncyamus* has been recorded from six delphinid genera, two of which we report for the first time here: *S. aequus* from *Sousa plumbea* (Cuvier, 1829) and *S. ilheusensis* from *G. macrorhynchus* (see Table 1).

Syncyamus ilheusensis appears to be closest in form to *S. aequus* but differs in body size, the presence of medial gills in males, the number of spines on the ventral surface of pereonite five, and the presence of a spine on the postero-medial margin of the basis of pereopod seven. A taxonomic key to the three species of *Syncyamus* is presented below.

Table 1. Published host records of species of the genus *Syncyamus*. Asterisk (*) indicates record of co-occurrence with *Isocyamus*.

Species	Original reference	Cetacean host	Locality of host at time of collection	Region on host
S. aequus	Lincoln and Hurley (1981)	*Tursiops truncatus*	Indian Ocean, South Africa, Natal	Blowhole
	Lincoln and Hurley (1981)	*Stenella coeruleoalba*	Indian Ocean, South Africa, Algoa Bay	Snout, blowhole
	Lincoln and Hurley (1981)	*Delphinus delphis*, *S. coeruleoalba*, *T. truncatus*	Indian Ocean, South Africa, East London and Algoa Bay	Mouth, blowhole
	Raga and Raduan (1982)	*S. coeruleoalba*	Mediterranean Sea, off Spain, Viladecans (Barcelona)	Blowhole
	Raga and Raduan (1982)	*S. coeruleoalba*	Mediterranean Sea, off Spain, Perelló (Valencia)	Blowhole
	Raga and Raduan (1982)	*S. coeruleoalba*	Mediterranean Sea, off Spain, El Saler (Valencia)	Blowhole
	Raga and Carbonell (1983)	*S. coeruleoalba*	Mediterranean Sea, off Spain	Blowhole
	Raga *et al*. (1983)	*S. coeruleoalba*	Mediterranean Sea, off Spain	A peu pres
	Raga (1988)	*S. coeruleoalba*	Mediterranean Sea, Spain, Valencia	Not given
	Sedlak-Weinstein (1991)*	*T. truncatus*, *Stenella longirostris*	Arafura Sea	Not given
	Mariniello et al. (1994)	*S. coeruleoalba*	Mediterranean Sea, Italy, Central Thyrrenian coast	Not given
	Haney (1999)	*D. delphis*	South Atlantic Ocean, off South Africa, Station 86/31, 34°06´S, 18°31´E	Jaw
	Haney (1999)	*S. coeruleoalba*	North Pacific Ocean, California, Maresa Beach	Gape of mouth
	present paper	*Sousa plumbea*	South Atlantic Ocean, off South Africa, Natal, Richard's Bay	Mouth
S. ilheusensis	present paper*	*Globicephala macrorhynchus*	South Atlantic Ocean, NE Brazil, Bahia, Ilhéus, 14°46´24°S, 39°03´12°W	Ocular mucosae
S. pseudorcae	Bowman (1955)	*Pseudorca crassidens*	Gulf of Mexico, Station 1298, 26°30´N, 89°15´W	Not given
	Sedlak-Weinstein (1991)*	*P. crassidens*	South Pacific Ocean, New South Whales, Crowdy Heads	Not given
Syncyamus sp.	Bowman (1958)*	*Stenella attenuata* [originally as *S. graffmani*]	Central Pacific Ocean, Panama Bay, 2 mi SE of Taboguilla Island	Blowhole and angle of jaws
	Leung (1970)	*D. delphis*	Mediterranean Sea, Gibraltar, off Marbella	Blowhole
	Haney (1999)	*S. attenuata*	Indian Ocean, near Reunion Island, Station 73/16, 21°42´S, 55°25´E	Tip of flipper
	Haney (1999)	*D. delphis*	South Atlantic Ocean, off South Africa, Station 77/5, 34°11´S, 18°25.5´E	Blowhole

1a. Pereonite 5 ventral surface with one pair of spines in male and smooth, lacking spines in female . . . . . *Syncyamus aequus* Lincoln and Hurley, 1981
1b. Pereonite 5 ventral surface with two pairs of acute spines in male 2
2a. Pereonite 2 anterior margin with medial and lateral lobes of invagination asymmetrical, medial lobes notably larger; pereonites 3 and 4 with smooth ventral surface, lacking paired spines; pereopod 7 basi-ischium ventral surface with small postero-medial spine . . . . . ***Syncyamus ilheusensis***, n. sp.
2b. Pereonite 2 anterior margin with medial and lateral lobes of invagination subequal in size; pereonites 3 and 4 with ventral surface bearing two pairs of spines (see Bowman, 1955: fig. 1c); pereopod 7 basi-ischium postero-medial surface even, lacking spine . . . . . *Syncyamus pseudorcae* Bowman, 1955

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